may traffic between cells, which offers the intriguing possibility that small RNAs may function as mobile signals in development.

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Program/Abstract # 5
Bucky ball establishes animal-vegetal polarity in the oocyte and in the follicle cell layer in zebrafish

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Establishing oocyte animal-vegetal (AV) polarity is crucial for determining the prospective embryonic axis and for establishing the germline through localization of the germ cell determinants in lower vertebrates. The first AV polarized oocyte structure is the Balbiani body, an evolutionarily conserved oocyte asymmetry present in all animals examined, including humans. Although identified more than 150 years ago, genes acting in Balbiani body assembly have not been identified in vertebrates. Here we report the molecular identity of the zebrafish bucky ball (buc) gene and show that it is required to assemble this universal asymmetric oocyte structure. Without buc, oocytes remain symmetrical, no Balbiani body forms, and vegetal mRNAs are not localized. In contrast, animal-pole mRNAs expand into vegetal regions in buc mutant oocytes, but patterning within the expanded animal pole is intact. Interestingly, somatic cell fate also relies on buc. In buc mutants too many somatic cells within the follicle cell layer develop as micropylar cells. This animal-pole specific somatic cell fate permits sperm to access the egg in zebrafish. In buc mutants, excess micropyles cause polyspermy. We show that buc functions during early oogenesis to polarize the oocyte, to establish the Balbiani body, and to localize mRNAs along the AV axis thereby establishing the first axis of the future embryo. The expansion of animal identity in oocytes and follicle cells suggests that somatic cell fate and oocyte polarity are interdependent.

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Program/Abstract # 6
Large P body-like RNPs form in *C. elegans* oocytes in response to arrested ovulation, heat shock, osmotic stress, and anoxia and are regulated by the major sperm protein pathway

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As *C. elegans* hermaphrodites age, sperm become depleted, ovulation arrests, and oocytes accumulate in the gonad arm. Large ribonucleoprotein (RNP) foci form in these arrested oocytes that contain RNA-binding proteins and translationally masked maternal mRNAs. Within 65min of mating, the RNP foci dissociate and fertilization proceeds. The majority of arrested oocytes with foci result in viable embryos upon fertilization, suggesting that foci are not deleterious to oocyte function. We have determined that foci formation is not strictly a function of aging, and the somatic, ceh-18, branch of the major sperm protein pathway regulates the formation and dissociation of oocyte foci. In addition, three P body proteins, DCP-2, CAR-1 and CGH-1, and two stress granule markers, poly (A) binding protein and TIA-1, localize to oocyte RNP foci; these data are the first in vivo demonstration linking components of P bodies and stress granules in the germ line of a metazoan. Furthermore, our data demonstrate that formation of oocyte RNP foci is inducible in non-arrested oocytes by heat shock, osmotic stress, or anoxia, similar to the induction of stress granules in mammalian cells and P bodies in yeast. These data suggest commonalities between oocytes undergoing delayed fertilization and cells that are stressed environmentally.

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Program/Abstract # 7
RNA transport in the oocyte cytoplasm: How to get there from here

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In many organisms, localization of maternal mRNAs provides the basis for developmental polarity. Among vertebrates, Vg1 mRNA is a prominent example of a localized mRNA that plays a role in embryonic patterning. Vg1 mRNA encodes a peptide growth factor and is localized during oogenesis to the vegetal cortical cytoplasm of *Xenopus* oocytes. In order to understand the mechanisms underlying directional RNA transport, we have probed the molecular interactions leading to assembly of a transport-competent RNA–protein complex. Our results have allowed us to trace the pathway for cytoplasmic RNA localization, from initiating events in the oocyte nucleus to the motors that accomplish RNA transport in the oocyte cytoplasm.

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Program/Abstract # 8
Global analysis of mRNA localization reveals a prominent role in the organization of cellular architecture and function

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The localization of mRNA molecules is an important regulatory mechanism for targeting proteins to specific cellular compartments, although the overall prevalence and variety of transcript localization events remains unknown. To characterize subcellular mRNA localization dynamics during early *Drosophila* embryogenesis, we conducted a high-throughput Fluorescent *In Situ* Hybridization (FISH) screen of over 4000 distinct mRNAs, and show that the majority of expressed mRNAs (71%) are subcellularly localized. Many novel varieties of subcellular localization patterns were identified, implicating localized mRNAs in the assembly and regulation of diverse cellular modules and processes.